



The Influence of Transit - Oriented Developments on Housing Cost and Ridership in Denver, Colorado

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Abstract

This research looks to understand how affordable housing policies can influence the success of compact, transit-oriented developments (TODs). Specifically, does the presence of affordable housing stock or affordable housing policy influence the use of public transportation ridership in TODs? Originally touted as a beneficial and sustainable form of development, transit-oriented developments have moved from the poster project of sustainable growth to potential hotspots for gentrification and unaffordable housing. The relationship between housing cost and TODs is largely supported in studies of cities all across the United States. However, what is not as strongly understood is the connection between TOD implementation and public-transit ridership. TODs should, in theory, increase ridership as they create high-density development near stops and encourage pedestrian access to transit through thoughtful urban design. However, if these developments are pushing out low-income households, the most likely demographic to use public transit, are they actually able to create increased ridership overall? This research looks to understand the relationship between TODs and transit ridership through case studies of four TODs within Denver. Each TOD falls along a spectrum of housing values to evaluate whether or not there is a relationship between housing cost and ridership. These case studies evaluate the change in ridership over a nine-year period in which the transit stop went through developments and improvements. The goal is to understand if TODs are a viable tool for managing and mitigating GHG emissions without the addition of affordable housing within the policy. Through a regression analysis, housing costs were shown to be negatively correlated with public transit ridership in the chosen study areas. Rising housing costs due to the economic boost of TODs have been shown to undermine the success of the transit redevelopment and investment to increase ridership. This demonstrates a need to consider affordable housing during TOD policy development.

Introduction

Each year the effects of climate change are increasingly felt in communities all across the world. These effects are predominantly located in communities that are largely not at fault for the influx of climate-altering greenhouse gas (GHGs) emissions into the atmosphere. This separation of causes from effects has drastically slowed progress to reduce global GHG emissions. The communities causing the largest share of GHG emissions, in general, feel the least of the effects due to the negative externalities of their behaviors. The challenge of dealing with climate change is best tackled through partnering it with other issues of great concern for communities. Housing costs and traffic concerns are well known across cities in the United States, so there could be great strides for all of these issues if we can draw better connections between them. Solving an environmental issue with the potential increase of development seems counterintuitive, but the relationship between housing, transportation, and climate is complex and extremely significant.

In this regard, the most pressing issues within urban communities have been, of late, how to grapple with a changing climate and a skyrocketing housing market. These issues are not isolated and would be tackled best in unison. Traditionally, research on climate change has focused on direct causes of greenhouse gas emissions, such as energy use, car emissions, and industrial air pollution. The indirect causes of GHGs, like long commutes, unaffordable housing, and density of land use have not been covered as extensively.

Transit-oriented developments (TODs) look to increase population and employment density and promote non-automobile transit to improve the environmental and economic sustainability of a community. However, these developments have been seen to increase land-values, and therefore, surge home and rental values in the absence of affordable housing policies.

This can cause TODs to be inaccessible to those most likely to use public-transportation, low-income households. From this viewpoint, it is unclear if TODs are truly maximizing their potential to increase public transit ridership. This brings into question the strength of TODs as a viable nor sustainable solution to climate change.

To understand the relationship between affordable housing and ridership within TODs, this research looks to quantify the relationship between housing costs and the use of public transportation before and after the development of a TOD. Using four transit stops with intentional TODs and varying housing costs within the city of Denver, this research will compare ridership before and after the TOD intervention as it relates to housing costs.

Literature Review

Transit-Oriented Developments and Housing

The rapid increase in urbanization creates a plethora of potential benefits for our global community. However, it is important to develop plans that take this concentration of resources and people into account within our changing climate. Urbanization, if compact, can greatly reduce GHG emissions, but sprawl and uncontrolled growth will have disastrous consequences (Floater, et al, 2014). This is the impetus for transit-oriented developments that look to create mix-use communities within walking distance of public transit stations. These TODs look to promote density and dissuade the use of personal vehicles for commuting.

TODs are typically a private-sector development designed to promote high-density, mixed-use spaces near public transit infrastructure. To be considered a TOD they must be near a transit stop, provide pedestrian access to the transit, and have TOD supportive land use, such as mix-use

zoning (Zhang et al, 2018). Their original purpose was to reimagine the relationship between land use and transportation planning to curb the use of personal vehicles. While these developments are seen as the ideal for compact, urban development, they lack concern for affordability. TODs, in their nature attract capital investment and therefore, higher land values. This spikes the housing and rental market making these ideal locations for transit commuters, inaccessible to low-income individuals and families, major users of public transit (Chava and Newman, 2016).

Research using data from Atlanta, Georgia TODs found that not only did these developments increase land values, but they made home values more resilient during and post-recession in 2008 (Zhang et al, 2018). Zhang, et al (2018) found that home prices within TODs rather than exclusively transit-adjacent were less affected by the sinking costs of the recession. This emphasizes the impact of the development of TODs on land values, their benefit to homeowners, and their harm to renters. Renters are predominantly lower income than homeowners and would have been greatly affected by potentially higher rent during the economic downturn as wages dropped. While TODs can improve the economic value of a community, this presents further evidence that affordable housing should be involved in the creation of TODs to avoid indirect harm to low-income households.

Research has long tried to understand how to combat gentrification and it has largely led to uncertain and varying conclusion. The most holistic research by Barton (1998) performed a literature review of a variety of sustainable neighborhoods. This work outlined the qualities of the most successful projects in promoting reduced GHG emissions without causing gentrification. The author found that market-led projects were the least successful, and neighborhood projects led by community non-profit trusts were the most successful in these terms (Barton, 1998). As stated,

TODs typically rely on the private market to spur development and investment. This leads to further concerns regarding gentrification and affordability after these projects are implemented.

Factors Influencing Public Transit Ridership

There are many factors that can affect the use of public transportation within a city. So many, that it is out of the scope of this research to try to articulate exactly why individuals chose a mode of transportation. What this research is trying to understand, within the scope of TODs, is if there is any relationship between housing affordability and ridership. The goal of TODs is to increase the use of public transit, but as stated, they have the potential to cause gentrification.

It has been historically thought that population and transit ridership are positively correlated. This has long been used to the rationale for the investment of public transit infrastructure (Guerra and Cervero, 2018). While this is not the entire picture of what impacts ridership and mode choice, public transit needs population density, not just high population to be a viable investment (Guerra and Cervero, 2018). Likewise, the presence of greater numbers of young people can increase public transit ridership (Brown, 2016). Again, there are many factors that can influence this behavior, but on the whole, increased population of younger people can increase the use of public transportation (Brown, 2016).

Wang and Woo (2017), performed a regression analysis on the impact of the suburbanization of poverty on suburban public transit use. They found that as lower-income individuals and families moved into suburban areas, the use of public transit significantly increased (Wang and Woo, 2017). This emphasizes that the use of public transit by low-income households is not just an urban phenomenon (Wang and Woo, 2017). There is also research suggesting a relationship between ridership and access to a personal vehicle. The greater access to a personal

vehicle negatively effects public transit use (Mallett, 2018). Access to a personal vehicle for travel to work is a sign of wealth. Many low-income households do not have this access and must rely on public transit to commute. Research has also shown that the concentration of poverty in central urban areas is due to the access to public transit, further bolstering the need to consider low-income households when planning TODs (Glaeser et al, 2008). Additionally, research in Columbus, Ohio found that quality and efficiency of the transit are indicators for use (Wu and Murray, 2005). The authors found that improving efficiency and reducing redundant routes, was able to create gains in ridership. TODs look to increase density and efficiency, but do not promote younger or lower-income residents without public sector interventions. The lack of focus on affordability provides the basis for this research. These ridership influencing variables were used to inform the chosen variables with which the case studies were selected.

Housing and Climate Change Framework

A review of decades of climate change literature presents the case that academia has developed a narrow understanding of the relationship between housing and climate change (Butler, 2018). Butler (2018) notes that the literature has long been narrowly bounded within specific disciplines to a fault. Advances in climate science have consistently advocated for more interdisciplinary research and focus. This broadened focus should also account for the effects of housing on the mitigation and adaptation to climate change (Butler, 2018). Rather than focus solely on the energy use of homes, Butler argues that more research should focus on how the size, placement, density, and affordability of residential areas can help or hurt work to mitigate climate change.

Edwards and Bulkeley (2015), also note the lack of connections made in literature on housing and climate change mitigation even though both housing and climate change are critical areas for urban studies. They argue that the Urban Political Ecology (UPE) perspective could better portray the relationship between housing and climate change and look to merge UPE literature with the governance of climate change through housing (Edwards & Bulkeley, 2015). They argue for an interdisciplinary view of urban studies to better understand the interplay between each sector, such as housing, transit, energy (Edwards & Bulkeley, 2015).

With this in mind, the California Department of Housing and Community Development researched the broader relationship between housing and climate and identified that investment in affordable housing is vital for mitigating climate change. They highlight the ability for affordable housing to increase energy efficiency and sustainable development due to smaller home sizes, lessened sprawl, and the higher use of public transportation (California Department of Housing and Community Development, 2013). The report also emphasizes the need to first preserve existing affordable housing rather than look to build new housing elsewhere (California Department of Housing and Community Development, 2013). This work ties together housing and public transit ridership at the onset to improve economic well-being and physical health for underserved communities. They are an example for cities looking to maximize the benefits of both TODs and affordable housing investment.

Isman, et al (2018) use an Ecological Footprint analysis to assess the effects of different sectors on greenhouse gas emissions. The two largest contributors in each case study were transportation and/or housing (Isman, et al, 2018). This emphasizes the need to see the nexus between these sectors when developing sustainable communities as a mitigation tool for climate

change. It has been argued that cities need to move toward comprehensive plans and zoning laws that allow mixed uses with integrated offices, housing, and retail spaces (Schuetz, 2019). Additionally, cities need to build dense affordable housing near job centers and transit infrastructure (Schuetz, 2019). Mixed-use, high-density development near transit is the goal of TODs, but these developments fail to consider the impact of affordability.

The market-effect of housing increasing in price when placed near transit and central business districts, pushes low-income and working-class citizens far away from where they may find employment opportunities. This causes those most likely to use public-transportation to live far from the urban core, and therefore far from this needed transit (Wiener & Kammen, 2019). It is important to create policy to build and maintain affordable housing near transit to reduce driving and manage GHG emissions (Wiener & Kammen, 2019).

In terms of the potential effects of suburbanized poverty, Hamidi, Jahan, and Moazzeni found that affordable housing developments between the central business districts of Dallas and Fort Worth were unaffordable to the target residents due to the high costs of transportation. Affordable housing within Dallas and Fort Worth, where there is access to public transportation, was almost always affordable to the target residents (Hamidi, Jahan, and Moazzeni, 2018). Affordable housing without public transportation access is not serving those it intended to, and if there are no affordable units near public transportation those set to benefit most from decreased transportation costs are priced out of the housing market. This further emphasizes the importance of considering both affordable housing and affordable public transportation when designing mixed-use, transportation-oriented developments.

This study looks to consider how the development of TODs and their policy in Denver, Colorado has influenced rates of ridership. The review of the aforementioned literature leads one to believe there may be affordability concerns in and around TODs due to rising land and housing costs. Knowing there are potential relationships between income and transit choice, the increased housing costs leading to higher income residents, could also play a role in the rate of public transportation use.

Data

As Denver has extensive TOD policy and focused much of the last decade of transportation planning on creating TODs, some with and some without affordable housing policy, it was chosen as the overarching study area for this work. Within Denver, four transit stations were selected as case studies. These case studies were chosen using the Center for Transit-Oriented Development Database, based on the established independent variables: population, the TOD rating from the City of Denver's TOD Continuum, and the years of development and completion. The chosen TODs are centered around rail transit, as this has previously been shown to create the most gentrification and displacement of low-income individuals. The choice of case studies was influenced by the work of Jacobson and Forsyth (2008) in which they outline best practices for urban design and TODs. These best practices and the ratings of the TOD qualities of each transit station defined by the City of Denver's TOD Strategic Plan helped to narrow down the selected stations (City of Denver, 2014). These ratings can be found in Table 3. Only stations with a Medium TOD rating or higher were considered. This helped to ensure that each case study is comparable in quality of design.

The effect of these TODs on housing prices and transit ridership was analyzed using 5-year American Community Survey (ACS) data from 2009 to 2018. Each of the chosen transit stations had TOD plans and policy implemented on or before this time range to ensure there was continuity in station design over each of the cases. The specific dates can be found in Table 3. The ACS data was collected at the census tract level for each transit station as this was the finest scale available for the locations. To avoid any potential overlap in tracts, the data was clipped to the geographic bounds of the buffer and averaged for each station area. The monthly housing cost in 2018 around each station is visualized in Figure 4. This shows the range of costs around station as well as comparatively between the stations. The 10th and Osage station was developed with affordable housing, so it is the station with the lowest average housing costs overall. From most expensive to least expensive the stations are Southmoor, Alameda, Louisiana-Pearl, and 10th and Osage.

The monthly housing costs in 2018 for the 0.5-mile buffer around each station can also be found in Table 1. In addition to monthly housing costs, Table 1 provides average per capita income and population for each study area. Per capita income is also visualized in Figure 3, which characterizes 10th and Osage station as having the lowest income community and Louisiana-Pearl station as having the highest. Summary statistics for all of the variables can be found in Table 2.

Through visualization alone it seems the highest public transit for commuting use is at 10th and Osage station, which also has the lowest monthly housing costs and income levels. Figure 2 provides a map of percent of commuters that use public transit in each study area. Likewise, the station with the highest housing costs, Southmoor, has some of the lowest rates of public transit use as shown in Figure 2.

Howell et al (2016) used commute length, mode of transportation, household median income, car ownership, household size, population, and per capita income to characterize the relationship between new developments and transit use. Howell's research influenced the data selection for this study and adjustments were made to fit the scope of this work. This data does not account for changes in transportation costs due to proximity to public transit. This could influence the outcome, but as this research is only looking at the 0.5-mile range around TODs, each site should be influenced by this gap in information equally. A similar analysis was completed by Renne, Tolford, and Ewing in 2016 to understand how different levels of compact transit development could influence housing and transportation cost across the United States, but they compared locations around transit to those far from transit.

Methods

To better understand the complex relationship between housing costs and ridership around public transit developments, this study evaluates four TODs within the city of Denver, Colorado. This quantitative analysis will use data from four transit stations from a period of 9 years to determine if there is a relationship between housing costs and public transit use. Denver has strictly defined TOD policy and planning along with well-known traffic and housing affordability concerns. This makes it a viable city to study TODs and their relationship with housing prices and ridership.

To further support the case study selection, the research of Seawright & Gerring (2008) on case study selection methods was reviewed. The authors describe the “most similar” method of case selection. This requires at least two case studies that are similar on all independent variables except that of interest (Seawright & Gerring, 2008). This helps to isolate the relationship of concern and create a basis for stronger analysis and understanding. Using this most similar method, this research studied four TODs within Denver that are similar in regard to population, racial demographics, and the years of development and completion. The only major difference is the cost of housing and per capita income around each transit stop. To filter out any influence due to neighboring developments, I used a buffer area to focus my analysis on a 0.5-mile radius of the transit station or TOD. This is the analysis range used in the work of Howell et al (2018), Jacobson and Forsyth (2008), Renne et al (2016), and Wang and Woo (2017). The chosen transit stations include 10th and Osage, Louisiana-Pearl, Alameda, and Southmoor. Locations and demographics for the 0.5-mile buffer around each station can be found in Figure 1 and Table 1, respectively.

The data for each of the chosen TODs was analyzed using a regression analysis to determine how each development with its varying housing affordability influences public transit use. Wang and Woo (2017) performed a regression analysis to document the suburbanization of poverty and how it has increased transit ridership in non-urban communities. They looked to measure the relationship between poverty and transit usage using a multiple regression method similar to the one proposed for this research. Their methods included defining a variable to represent the ratio of transit users that commute relative to all commuters in each analysis area and regressing this over socioeconomic characteristics such as income, and employment, physical characteristics such as the presence of renter-occupied housing, density, and land use, and

transportation variables such as mode of commuting, travel time for commuting, and car ownership (Wang and Woo, 2017). This work is beneficial for understanding if the TODs lack of affordable housing is a major driver of a lack of ridership.

The data for this study included housing, income, population, and transportation variables to fully characterize any potential influences on ridership. Descriptions for these variables can be found in Table 1. The research controlled for physical differences between developments by choosing transit stations within urban land use classifications and using the Center for Transit-Oriented Development's TOD database as the source for the case studies. This helped to filter out any influence due to major differences in land use, density, and the presence of rental housing. The basic regression provides insight into the relationship between TODs and commute choice controlling for increases in the number of vehicles per household, housing costs, and income. The housing variable accounts for monthly housing costs for homeowners and renters, the income variable includes the per capita income of the study area population, the population variable includes any population growth or decline, and the transit variable characterizes the ratio of public transit commuters in the study area and the number of vehicles per household.

Table 1. Description of variables for analysis

Variable	Years	Description	Source
Population	2009 - 2018	Total population by census tract	Census American Community 5-year Survey 2009-2018
Monthly Housing Cost (\$)	2009 - 2018	Self-identified cost of housing for one month by census tract	Census American Community 5-year Survey 2009-2018
Per Capita Income (\$)	2009 - 2018	Self-identified per capita annual income by census tract	Census American Community 5-year Survey 2009-2018
Public Transit (%)	2009 - 2018	Percent of people taking public transit to work by census tract	Census American Community 5-year Survey 2009-2018
Vehicle	2009 - 2018	Number of households with a personal motor vehicle by census tract	Census American Community 5-year Survey 2009-2018

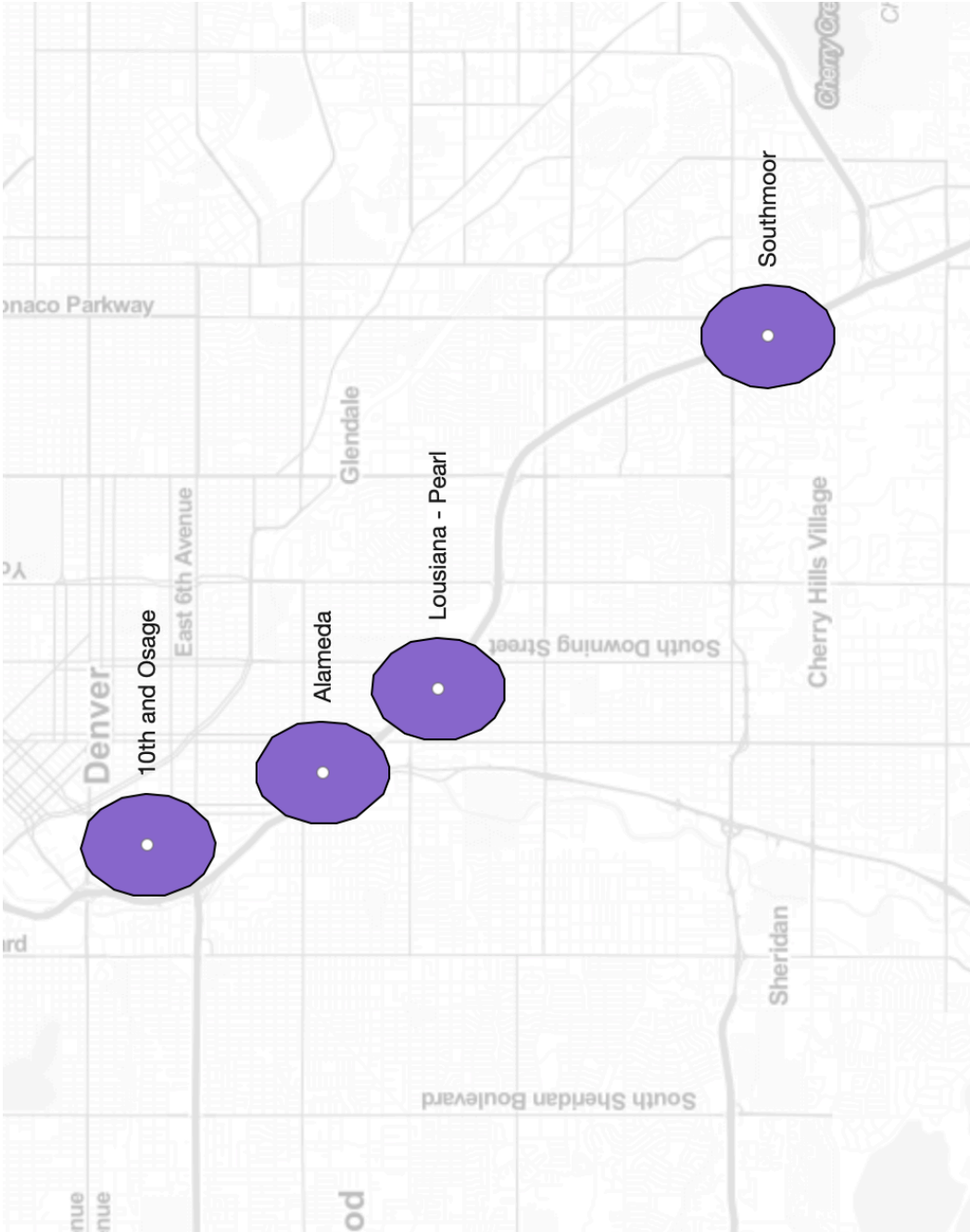
Table 2. Summary statistics of variables for analysis

Variable	Minimum	Median	Mean	Maximum	Standard Deviation
Population	2692	4023	3884	4585	498.6815
Monthly Housing Cost	\$1,237	\$1,857	\$1,770	\$2,210	\$272.7919
Per Capita Income	\$20,524	\$28,203	\$37,195	\$63,882	\$12,715.30
Public Transit	4.586%	7.681%	8.565%	17.458%	3.341198%
Vehicle	1223	2153	2063	2613	425.4069

Table 3. Transit Station Demographics

Station	Longitude	Latitude	2018 Population in 0.5-Mile Buffer	2018 Average Per Capita Income in 0.5-Mile Buffer	2018 Average Monthly Housing Cost in 0.5-Mile Buffer	TOD Rating	Development Year
10th and Osage	-105.005705	39.73214639	3,492.00	\$26,103.25	\$1,497.75	High	2009
Louisiana - Pearl	-104.97822	39.69283	4,584.80	\$63,882.40	\$1,870.80	Medium - High	2009
Southmoor	-104.9161	39.64823	4,248.40	\$52,951.75	\$2,209.75	Medium - Low	2006
Alameda	-104.99289	39.70859	4,484.00	\$36,387.80	\$2,046.00	Medium - High	2007

Figure 1. Study
Areas of Denver
Central Corridor
Light Rail Line
stations



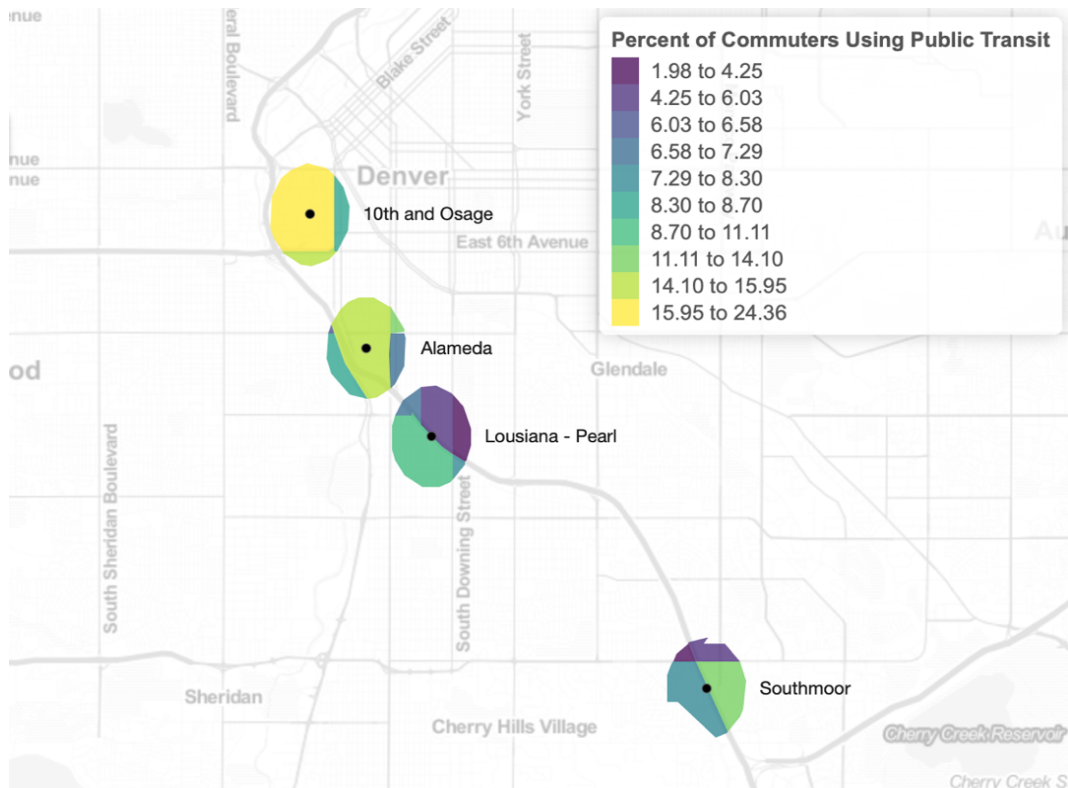


Figure 2. Average percent of commuters using public transit in the 0.5-mile buffer area of the chosen transit stations

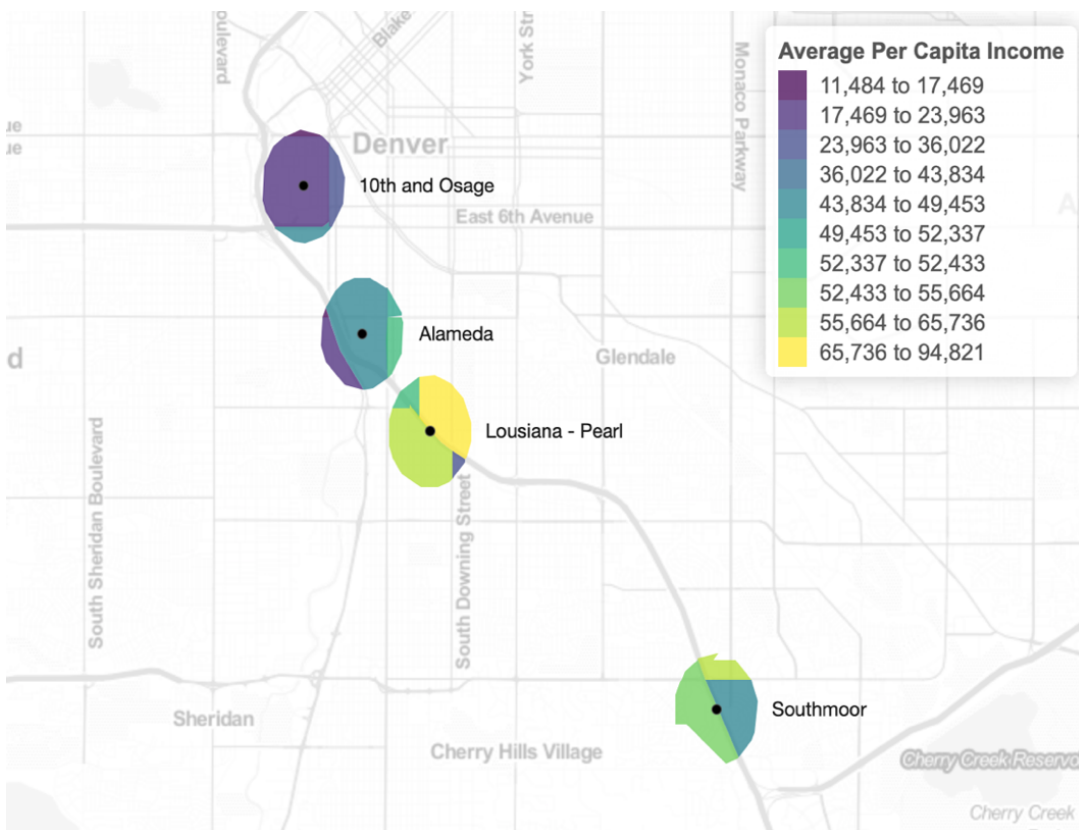


Figure 3. Average per capita income in the 0.5-mile buffer area of the chosen transit stations

Results

The results of this work present the estimated relationship between average monthly housing cost and average percent of commuters choosing public transit of each transit station within the 0.5-mile buffer zone of each transit station. The influence of personal vehicles per household, population, and per capita income variations were controlled for within the multivariate regression. The results of this regression can be found in Table 4, which provides the estimates, standard error, and significance for each variable.

In the buffer around each station, an increase of one dollar of average monthly housing costs results in a 0.01456% decrease in the average percent of commuters taking public transit to work. For clarity, this would be a 14.56% decrease in percent of commuters using public transit for every \$1,000 increase in average monthly housing costs. This relationship is significant with a

Table 4. Multiple regression of monthly housing costs, households with vehicles, and per capita income on percent public transit from 2009 to 2018

Variables	Estimate	Standard Error	Significance
Intercept	16.18	3.765	0.000132***
Monthly Housing Costs	-0.01456	0.004259	0.001611**
Population	0.007546	0.003410	0.033540*
Per Capita Income	-5.586* 10 ⁻⁵	5.026* 10 ⁻⁵	0.273957
Households with Vehicles	-0.004393	0.003212	0.180171
Adjusted R²	0.6991		
Residual Standard Error	1.833 on 35 DF		
P-Value	1.545 * 10 ⁻⁹		
F-Statistic	23.65 on 4 and 35 DF		

p-value of 0.001611. As expected, the model also shows a significant relationship between population and transit use. The increase of one person in the study area population results in a 0.007546% increase in the average percent of commuters taking public transit to work. Again, for clarity this would be a 7.56% increase in the percent of commuters using public transit for every 1,000 people added to this 0.5-mile range around each TOD. The magnitude of the impact of monthly housing costs on public transit use in the study area is a magnitude of ten large than that of the relationship with population.

The standard error for the predicted relationship of housing costs with percent of commuters using public transit is about a third of the estimate creating a range of -0.0188% and -0.013%. This range of correlation between monthly housing cost and percent of commuters using public transit use is broad considering the magnitude of the relationship, but it is consistently negative throughout. This provides more clarity for the validity of the negative relationship.

The variables of per capita income and households with vehicles both have an insignificant relationship, which indicates that population and monthly housing costs are more of a determinant of public transit use than the presence of lack thereof of personal vehicle access and changes in income. Running a collinearity test on the regression provided evidence that with all variables excluding per capita income there is a potential for collinearity with the other variables. This analysis was completed using the variance inflation factor to determine any collinear relationships. The VIF values were higher than ideal, but do not invalidate the results of this study.

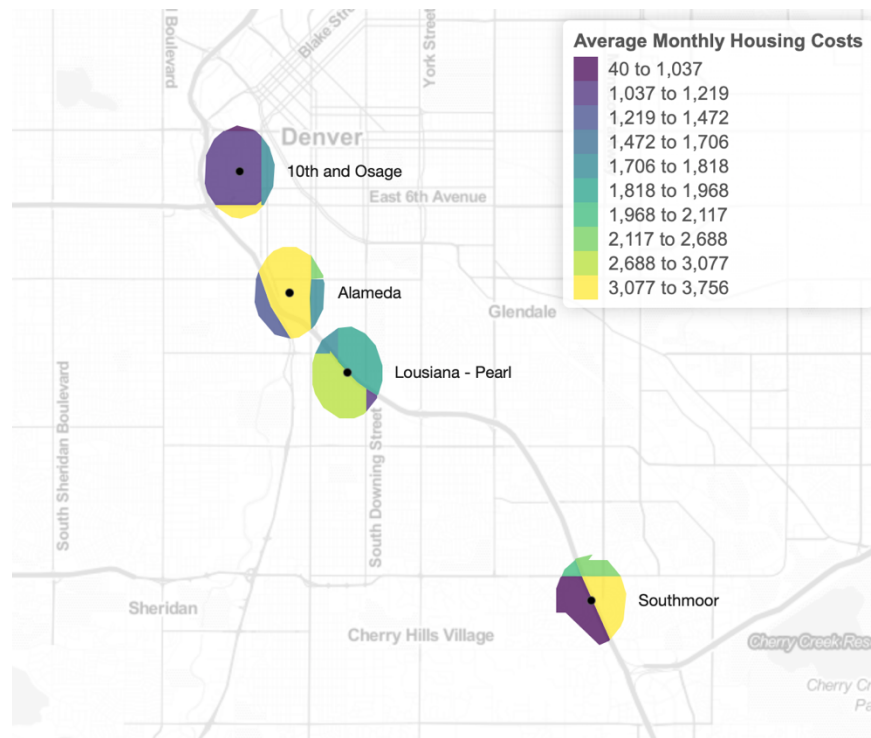


Figure 4. Average monthly cost of housing in the 0.5-mile buffer area of the chosen transit stations

Discussion

The magnitude of the relationships between each variable are low, but potentially significant when expanded to the population of each TOD. For instance, each \$1 increase in monthly housing costs or \$12 total housing cost each year would result in the loss of around 2% of public transit commuters within each study area annually. Housing costs are likely to grow by much more than \$12 each year, with the average rents seeing increases of about 2.2% across all of Denver (Garrison, 2019). A 2.2% increase in housing costs at the 10th and Osage station would result in an approximately \$33 increase for each individual, leading to even greater losses in public transit riders. These numbers are exclusive to this study, but their implications could be extremely meaningful for future transit and housing planning. It was previously understood that population and income could affect public transit ridership, but this study alludes to a statistically significant relationship between housing costs and transit mode choice in regard to public transportation. This creates evidence for the need to consider housing affordability when planning for TODs.

While it has previously been understood that TODs can increase housing costs in the areas surrounding the development, this research points to the potential for this increase to have a negative effect on the use of the transit station by nearby residents. The goal of a TOD is to create a development in which most people are able to easily access public transit or other alternative sources of transit such as cycling or walking. Those living in the surrounding developments and communities are encouraged and incentivized to use the public transit through the design, investment, and marketing of the TOD. However, the cost of living in these communities could undermine the potential gains in transit ridership. This reduces the potential benefits of reduced driving, traffic, and emissions of GHGs due to daily commutes in personal vehicles.

Moving forward, understanding this tendency for housing costs to increase around TODs and how that can affect the use of public transit should play a large role in transportation planning and policymaking. The accessibility of affordable housing should be a component of future TOD policy if municipalities want to maximize the benefits of TODs and the use of public transit. As TODs are seen as a tool to creating more sustainable cities, it is crucial that the social and economic sustainability of such policies are considered. This is especially important, if the results of this study hold true for other transit stops and other cities. If TODs without mechanisms to maintain affordable housing costs are reducing the potential population of public transit commuters, they could fundamentally lack the expected environmental benefits of such projects. This also reduces the financial stability of a transit stop and the transit system of a city, because without constant and hopefully increasing ridership, the system lacks the financial means to maintain itself nor make improvements.

Limitations

The given study is primarily limited by the small sample size and exclusivity to Denver. An expansion of this work to an entire city and then to multiple cities could provide more insight on the general relationship between housing costs and public transit use. Additionally, this study utilized ACS data at the Census Tract level, which are less reliable than other sources and grains of data. The ACS data is an estimation based on a small sample of communities rather than the household specific data collected in the Decennial Census or parcel-level data that could be accessed by a city or other municipality.

Additionally, the study was limited by the access to ridership data for the study areas. Ridership data is difficult to find, especially over any period of time without access to regional transit agency data. This led to the use of ACS data that relies on self-reporting of transit use for commutes. This does not factor in public transit use for other travel activities, information that actual ridership data for each station could provide. Additionally, the ACS presents self-reporting of monthly housing costs rather than actual home value and rental data. This more accurate data is only available at the zip-code level publicly making it less useful for a study of this size. The availability of parcel-level or tract-level data for accurate housing costs would greatly improve the accuracy and applicability of this study.

Conclusion

Overall, this work shows a connection between housing cost and transit use for the given study areas, further bolstering the need to expand climate change research and make better connections between housing affordability, transportation planning, and sustainability efforts. Additionally, travel mode choice is a complex subject worth expanding on in future work to understand each of the characteristics that can increase or decrease public transit use in communities. Moving forward, TODs and other densifying and pro-public transit developments should be a part of urban and regional planning, but not without the consideration of socioeconomic effects. Affordable housing and climate change are intertwined outside of public transportation use and it is a folly to create policy for one without considering the potential effects on the other.

This research provides an alternative lens for understanding the potential negative effects of TODs. If the gentrification caused by these large private investments is decreasing the use of the nearby transit station, it seems difficult to argue for the benefits of TODs from the planning perspective. This study is small and unlikely to encourage the alteration of large-scale transit policy but should provide evidence that more consideration be given to affordable housing when making investments into the urban form. Low-income communities have long been residents of the dense, urban core centered around public transit that city and sustainability planners advocate for in TODs today, they should be recognized for this and seen as an asset worth preserving in these communities.

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